# CLAIMS

We claim:

1. A system for combining waves of electromagnetic energy comprising:

a first transmission plate having an input surface at a first edge and an output surface at a second edge,

a second transmission plate having an input surface at a first edge and an output surface at a second edge; and

at least one of the first transmission plate and the second transmission plate further including a reflection discontinuity for reflecting emitted waves that enter the input surface to the output surface.

2. The system of claim 1 further comprising a first bar of a first plurality of wave emitters and a second bar of a second plurality of wave emitters.

3. The system of claim 2 wherein the first bar and second bar are diode bars.

4. The system of claim 2 wherein:

the input surface of the first transmission plate is substantially parallel to the first bar such that a plurality of first waves emitted by the first plurality of wave emitters enter the input surface in a direction of propagation that is substantially normal to the input surface; and

the input surface of the second transmission plate being substantially parallel to the second bar such that a plurality of second waves emitted by the second plurality of wave emitters enter the input surface in a direction of propagation that is substantially normal to the input surface

5. The system of claim 4 wherein the system further comprises a plurality of the first bars, a plurality of the second bars, a plurality of the first transmission plates corresponding to

the plurality of first bars and a plurality of the second transmission plates corresponding to the plurality of second bars and wherein the plurality of first and second transmission plates are interleaved and positioned with respect to the corresponding pluralities of first and second bars such that the emitted waves of the first plurality of wave emitters and the second plurality of wave emitters are interleaved in an output region comprising the output surfaces of the first and second transmission plates.

6. The system of claim 1 wherein the transmission plates are positioned such that the output surface of the first transmission plate and the output surface of the second transmission plate are co-planar and adjacent.

7. The system of claim 1 wherein the transmission plates are positioned such that output waves provided at the output surface of the first transmission plate and the output surface of the second transmission plate are output in a direction of propagation that is substantially normal to the output surface.

8. The system of claim 1 wherein the reflection discontinuity comprises an angled edge surface of the transmission plate.

9. The system of claim 8 wherein the angled edge surface is treated with a reflective coating.

10. The system of claim 1 wherein the waves entering the first and second transmission plates undergo total internal reflection between the input surface and the output surface.

11. The system of claim 1 wherein the first and second transmission plates are bonded together.

12. The system of claim 1 further comprising a shim between the first and second

transmission plates and wherein the first and second transmission plates are bonded to the shim.

13. The system of claim 1 wherein both of the first and second transmission plates include the reflection discontinuity.

14. The system of claim 1 wherein the input surfaces of the plurality of first transmission plates lie along a first input plane and wherein the input surfaces of the second transmission plates lie along a second input plane, and wherein the output surfaces of the plurality of first and second transmission plates lie along a common output plane.

15. The system of claim 14 wherein the first input plane and second input plane are coplanar.

16. The system of claim 14 wherein the first input plane and second input plane are parallel and spaced apart.

17. The system of claim 14 wherein the first input plane and second input plane are at an angle relative to each other.

18. The system of claim 14 wherein at least one of the first input plane and second input plane is at an angle relative to the output plane.

19. The system of claim 18, wherein the angle is 90°.

20. The system of claim 14 wherein at least one of the first input plane and second input plane is parallel to the output plane.

21. The system of claim 14 wherein the input surfaces of at least one of the plurality of the

first and second transmission plates are bonded to a common input base plate.

22. The system of claim 14 wherein the output surfaces of the first and second transmission plates are bonded to a common output base plate.

23. The system of claim 1 wherein the input surface of at least one of the first and second transmission plates includes an integral lens structure for focusing incident electromagnetic energy to within the transmission plate.

24. The system of claim 1 wherein the first plate has a propagation length between the input surface and the output surface that is different from that of the second plate.

25. The system of claim 1 wherein the waves of electromagnetic energy comprise laser beams.

26. The system of claim 1 wherein the system comprises a plurality of the first transmission plates and a plurality of the second transmission plates and wherein the plurality of first and second transmission plates are interleaved.

27. A system for combining waves of electromagnetic energy comprising:

a plurality of first bars of a first plurality of wave emitters;

a plurality of second bars of a second plurality of wave emitters;

a plurality of first plates corresponding to the plurality of first bars;

a plurality of second plates corresponding to the plurality of second bars; and

at least one of the plurality of first plates and the plurality of second plates including a reflection discontinuity for reflecting emitted waves of the wave emitters of the corresponding plurality of first and second bars to an output region, the first and second plates being interleaved and positioned with respect to the corresponding

pluralities of first and second bars such that emitted waves of the first plurality of wave emitters and the second plurality of wave emitters of the first and second bars are interleaved in the output region.

28. The system of claim 27 wherein:

each of the plurality of first plates comprises a first transmission plate having an input surface at a first edge and an output surface at a second edge, the input surfaces of the first transmission plates being substantially parallel to the first bars such that a plurality of first waves emitted by the first plurality of wave emitters of each first bar enter the input surface in a direction of propagation that is substantially normal to the input surface;

each of the plurality of second plates comprises a second transmission plate having an input surface at a first edge and an output surface at a second edge, the input surfaces of the second transmission plate being substantially parallel to the second bars such that a plurality of second waves emitted by the second plurality of wave emitters of each second bar enter the input surface in a direction of propagation that is substantially normal to the input surface; and

wherein the reflection discontinuity reflects emitted waves that enter the input surface of the respective transmission plate to the output surface

29. The system of claim 28 wherein the transmission plates are positioned such that the output surfaces of the first transmission plates and the output surfaces of the second transmission plates are co-planar and interleaved.

30. The system of claim 29 wherein the transmission plates are positioned such that output waves provided at the output surfaces of the first transmission plates and the output surface of the second transmission plates are output in a direction of propagation that is substantially normal to the output surfaces.

31. The system of claim 28 wherein the waves entering each of the first and second transmission plates undergo total internal reflection between the input surface and the output surface.

32. The system of claim 27 wherein a cross-sectional area of the output region is less that a sum of an area of a first input region corresponding to the plurality of first bars and an area of a second input region corresponding to the plurality of second bars.

33. The system of claim 32 wherein the cross-sectional area of the output region is approximately equal to the greater of the areas of the first and second input regions.

34. The system of claim 27 wherein the reflection discontinuity comprises an angled edge surface of the plate.

35. The system of claim 34 wherein the angled edge surface is treated with a reflective coating.

36. The system of claim 35 wherein the reflective coating is inwardly reflective, into the plate.

37. The system of claim 35, wherein the reflective coating is outwardly reflective.

38. The system of claim 37, wherein each of the plurality of first plates include a lens or graded index profile.

39. The system of claim 27 wherein the plurality of first and second plates are bonded together.

40. The system of claim 27 further comprising a shim between the first and second plates and wherein the first and second plates are bonded to the shim.

41. The system of claim 27 wherein both of the first and second pluralities of plates include the reflection discontinuity.

42. The system of claim 27 wherein the first plurality of bars lie along a first input plane and wherein the second plurality of bars lie along a second input plane, and wherein a cross section of the output region lies along an output plane.

43. The system of claim 42 wherein the first input plane and second input plane are coplanar.

44. The system of claim 42 wherein the first input plane and second input plane are parallel and spaced apart.

45. The system of claim 42 wherein the first input plane and second input plane are at an angle relative to each other.

46. The system of claim 42 wherein at least one of the first input plane and second input plane is at an angle relative to the output plane.

47. The system of claim 46, wherein the angle is 90°.

48. The system of claim 42 wherein at least one of the first input plane and second input plane is parallel to the output plane.

49. The system of claim 42 wherein the output surfaces of the first and second plates are

bonded to a common base plate.

50. A method of combining waves of electromagnetic energy comprising:

emitting a plurality of first waves at a plurality of first bars of a first plurality of wave emitters;

emitting a plurality of second waves at a plurality of second bars of a second plurality of wave emitters; and

transferring the emitted plurality of first waves and second waves to an output region using a plurality of first plates corresponding to the plurality of first bars and a plurality of second plates corresponding to the plurality of second bars; and

reflecting at least one of the plurality of first waves and second waves at a reflection discontinuity;

outputting the emitted first and second waves as a combined output wave at the output region.

51. The method of claim 50 wherein the first and second plates are interleaved and positioned with respect to the corresponding pluralities of the first and second bars such that emitted waves of the first plurality of wave emitters and the second plurality of wave emitters of the first and second bars are interleaved in the output region.

52. The method of claim 50 wherein the first and second plates comprise first and second transmission plates and wherein:

a plurality of first waves emitted by the first plurality of wave emitters of each first bar enter input surfaces of the first transmission plates in a direction of propagation that is substantially normal to the input surfaces;

a plurality of second waves emitted by the second plurality of wave emitters of each second bar enter input surfaces of the second transmission plates in a direction of propagation that is substantially normal to the input surfaces; and

wherein the reflection discontinuity reflects emitted waves that enter the input surface of the respective transmission plate to the output surface.

53. The method of claim 52 wherein the transmission plates are positioned such that the output surfaces of the first transmission plates and the output surfaces of the second transmission plates are co-planar and interleaved.

54. The method of claim 53 wherein the transmission plates are positioned such that output waves provided at the output surfaces of the first transmission plates and the output surface of the second transmission plates are output in a direction of propagation that is substantially normal to the output surfaces.

55. The method of claim 52 wherein the waves entering each of the first and second transmission plates undergo total internal reflection between the input surface and the output surface.

56. The method of claim 50 wherein a cross-sectional area of the output wave at the output region is less that a sum of an area of a first input region corresponding to the plurality of first bars and an area of a second input region corresponding to the plurality of second bars.

57. The method of claim 56 wherein the cross-sectional area of the output region is approximately equal to the greater of the areas of the first and second input regions.

58. The method of claim 50 wherein the reflection discontinuity comprises an angled edge surface of the plate.

59. The method of claim 57 wherein the angled edge surface is treated with a reflective

coating.

60. The method of claim 59 wherein the reflective coating is inwardly reflective, into the plate.

61. The method of claim 59 wherein the reflective coating is outwardly reflective.

62. The method of claim 50 wherein both of the first and second pluralities of plates include the reflection discontinuity.

63. The method of claim 50 wherein the first plurality of bars lie along a first input plane and wherein the second plurality of bars lie along a second input plane, and wherein a cross section of the output region lies along an output plane.

64. The method of claim 63 wherein the first input plane and second input plane are coplanar.

65. The method of claim 63 wherein the first input plane and second input plane are parallel and spaced apart.

66. The method of claim 63 wherein the first input plane and second input plane are at an angle relative to each other.

67. The method of claim 63 wherein at least one of the first input plane and second input plane is at an angle relative to the output plane.

68. The method of claim 67, wherein the angle is 90°.

69. The method of claim 63 wherein at least one of the first input plane and second input

plane is parallel to the output plane.